

## **Septic Systems and Lake Quality: Are Septic Systems a Problem in Your Watershed?**

### **Introduction**

It is no secret; in many areas of New Hampshire, particularly in areas located away from town centers, a public sewer system is not available. Therefore, a large percentage of residences and businesses in the state, and especially near the shorelines of lakes and ponds, are served by an on-site individual disposal system. The most common type of individual disposal system is the septic system.

Two studies completed on New Hampshire's lakes showed that while septic systems achieved their expected goals of collecting organic material and retaining bacteria, a high percentage of phosphorus introduced into septic systems was released by the leach field to the underlain bedrock where it flowed into the lake as groundwater seepage. The percent of phosphorus that is removed from a septic system is dependent upon the type of system, the soil type, the system age, and the distance to bedrock. However, the greatest reduction of septic system phosphorus is the result of recent legislation that reduced the amount of phosphorus that is allowed in detergents to only trace amounts (this law did not reduce the amount of phosphorus allowed in automatic dishwasher detergents). As a result of this law, it is calculated that a phosphorus reduction of approximately thirty to forty percent from septic systems to the lake is now occurring around unsewered shoreline property.

It is also not a secret that many existing septic systems receive higher volumes of water and waste than the system was originally designed to handle. This is due to the frequent use of dishwashers, garbage disposals, water softeners, washing machines, and other such water-using machines. In addition, a recent trend along the shorelines of lakes and ponds in the New Hampshire is for homeowners to convert seasonal cottages to year-round homes.

Therefore, the New Hampshire Department of Environmental Services (DES) recommends that all property owners along lakes, ponds, rivers and streams assess their septic system to determine if it meets current demands. DES encourages owners of systems that do not meet current demands to upgrade or replace the system. This will help protect the quality of surface waters throughout the state.

### **How does a Septic System Work?**

Septic systems act as the digestive tract for household organic waste by utilizing bacteria to break down organic matter. The most commonly approved systems today consist of a septic tank connected to a leach field, as shown in Figure 1. The septic tank functions to separate the solids, both floating and settleable, from the liquid material. (The accumulated sludge in the tank should be pumped out on a regular basis.) The liquid effluent is discharged from the tank through piping material and distributed over the leaching area, where the organic particulates are decomposed by bacteria, and other impurities are removed from the effluent before it percolates into the groundwater.

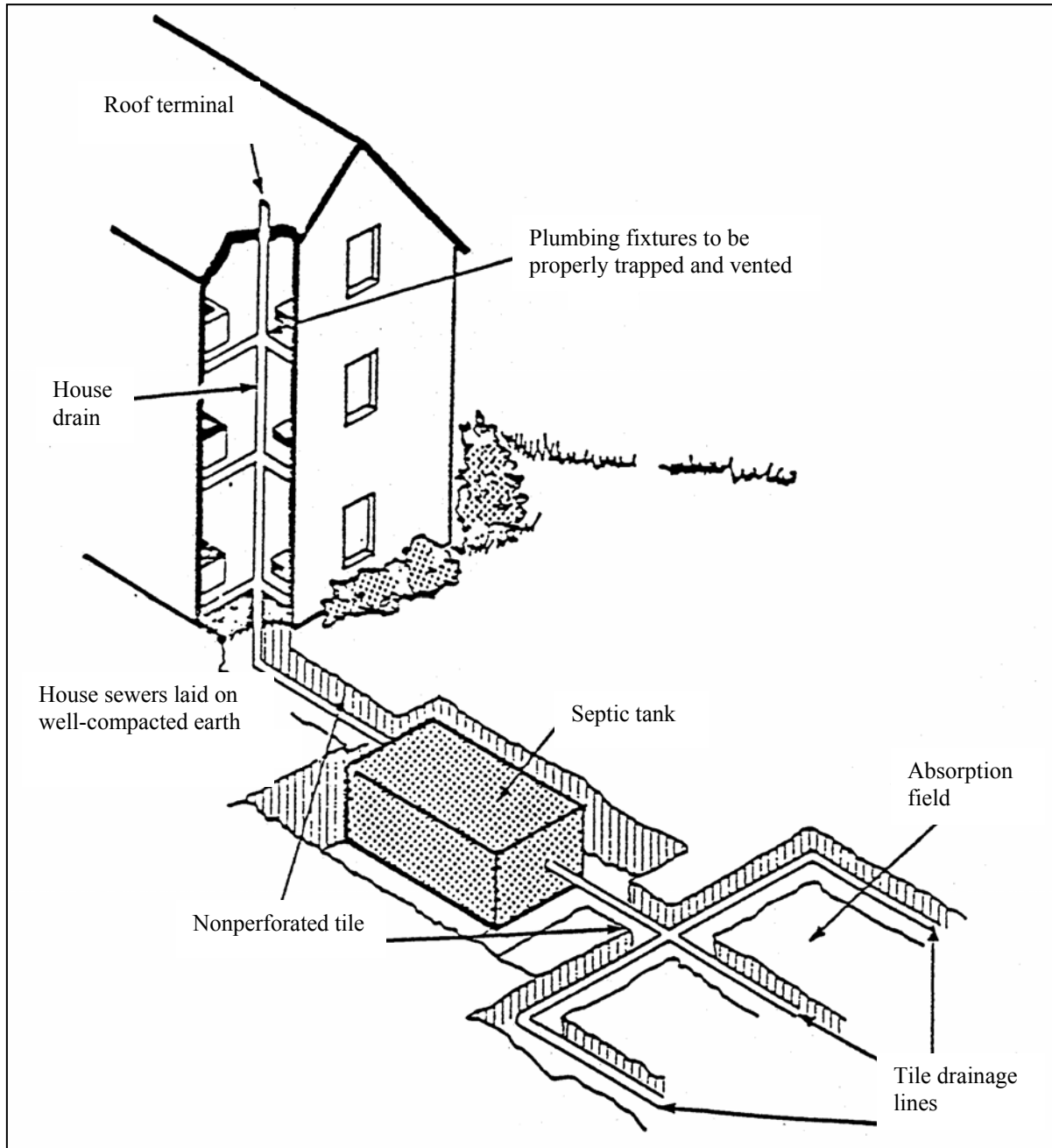


Figure 1: General Septic System Design

**How is water quality related to septic systems?**

Certain nutrients and bacteria build up in organic waste from your home and are dissolved in the water that ends up in the leach field. In septic systems that are not functioning properly, the nutrients and bacteria that do not get filtered out eventually drain into the water table below the ground or drain into nearby streams, rivers, and lakes. Nutrients, especially phosphorus, are vital to plant and algae growth. High levels of phosphorus, however, act as a fertilizer and create an environment where plant and algal growth is unnaturally accelerated. This deprives aquatic animals of vital dissolved oxygen and will speed up lake aging through the build up of plant and algal matter. Some types of bacteria can pose health threats to people who swim in contaminated surface waters or use water from the lake or nearby dug wells for drinking water purposes.

**How can I be sure my system is working properly?**

The life-expectancy of many septic systems is in the range of only ten to fifteen years. However, septic systems often fail before their life-expectancy is reached because of their use in unsuitable areas or because of improper design, construction, or maintenance.

In order to minimize the amount of phosphorus and bacteria build up, septic system owners must act responsibly when addressing waste disposal. Be sure to contact your state and local agencies to determine whether your existing septic system, meets all the regulations.

If your present system is up to date, follow these simple guidelines to help maintain the natural flow of nutrients:

- Compost your kitchen garbage rather than using a garbage disposal. This keeps many nutrients from directly entering the water system.
- Report any sudden increase in aquatic algae or plant growth in nearby streams, rivers, or lakes to the proper officials. This may be an indication of a phosphorus overload.
- Conserve water whenever possible. The more water in your septic system, the greater the possibility of nutrients leaching out through the system.
- Never flush toxic materials (such as chlorine, paint, oil, or pesticides) down the drain. Not only do you risk the possibility of tainting your own drinking water, but you will also kill natural bacteria in your septic system that break down organic waste.
- Avoid flushing bulky materials down the drain. These will often clog your system and slow the decomposition process.
- Use phosphate-free or low phosphate automatic dishwashing detergents.
- Run laundry or dishwashing cycles after a full load has been collected. This not only conserves water but will cut down on the amount of phosphates that drain into your septic system.

In addition to limiting what enters your septic system, you should have your septic tank pumped out by a licensed septage hauler on a routine schedule. DES recommends that septic system owners living along the lake edge have their septic system pumped and inspected every one to three years. Beyond the lake edge, DES recommends that residents have their system pumped and inspected every three to five years. During pumping, the service person can inspect the system for any problems and determine the loading to the system.

Also, you should be aware of the warning signs of a system in failure. Slower flushing or draining toilets and sinks, obvious septic smells, soft and moist ground over the leachfield, and even pooling water over the leachfield, are all signs that the system may be in failure. You should contact a septage hauler immediately if you observe any of these problems!

If your system is fifteen years or older, chances are that it is outdated, and is in need up being upgraded or replaced. If you plan to build a new septic system, it must be permitted by DES.

### **How can your lake association determine if septic systems along the lake are a problem?**

In order to assess the threat that septic systems pose to the quality of your lake or pond, DES suggests that your lake association conduct a watershed-wide septic system survey. Specifically, it is recommended that each property owner in the watershed be asked to fill out a septic system survey. Because septic system issues are often sensitive, this survey can be anonymous. An example survey that your association can use is included at the end of this article.

After your association receives the completed surveys and tabulates the results, please contact the VLAP Coordinator to set up an appointment. The VLAP Coordinator will discuss the results of the survey with you and will help you formulate a plan for future septic system management within the watershed. Future activities could include conducting an educational outreach program to educate watershed residents on how to properly maintain systems, upgrading existing systems, and/or using alternative wastewater treatment technologies.

### **Under what conditions do septic systems get upgraded?**

The upgrading of old or failing septic systems could occur through various ways, including:

1. Voluntary replacement;
2. Proven failure and subsequent order to replace from the town health officer or the DES Subsurface Bureau;
3. Conversion from season to year-round use or addition of bedrooms; or
4. Engineering study conducted prior to the house sale showing evidence that the septic system was in need of repairs or replacement.

Upgrading an outdated failing septic system to an acceptable conventional system may not always be possible. Problems arise when the required design of the field is impractical or impossible due to lot restrictions and/or soil and groundwater conditions. For example, when soils are poor (i.e., low permeability) or wastewater flows are high, the leaching field must be large. It may not be possible to construct large leach fields on small lakefront lots. Therefore, alternative waste disposal systems may need to be considered.

### **Alternative Waste Disposal Systems**

During the past several years, DES has approved many new innovative technologies for the treatment and disposal of wastewater to subsurface systems. All new "innovative/alternative" systems for on-site treatment or disposal of wastewater below the ground need approval from DES.

A variety of alternatives are possible for the upgrading individual treatment systems. Each alternative has limitations for proper operation including difficult climate, terrain, soils, and or/groundwater conditions, personal acceptance, technical and administrative problems. A summary of alternative waste disposal systems is presented in Table 1.

### **Additional Information**

For further information regarding the maintenance or upgrading of septic systems, please contact:

N.H. Department of Environmental Services  
Subsurface Systems Bureau  
PO Box 95  
Concord, NH 03302-0095  
Telephone: (603) 271-3501

If you would like additional information regarding conducting a watershed septic system survey, please contact:

Andrea LaMoreaux, VLAP Coordinator  
N.H. Department of Environmental Services  
Watershed Management Bureau  
PO Box 95  
Concord, NH 03302-0095  
Telephone: (603) 271-2658  
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**Table 1: Alternative Waste Disposal Systems**

<b>Treatment Method</b>	<b>What is it?</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Special Considerations</b>
<b>Regional Waste Treatment</b>	Municipal sewer system.	Waste is pumped away from the lot and possibly out of the watershed.	Can be a costly construction project.	State revolving fund monies may be used as low interest loans to support sewer installation.
<b>Cluster Systems</b>	Innovative systems that collect and treat sewage for many homes or groups of homes. Cluster systems are becoming more popular as alternative systems.	Cluster systems are usually simple and cost effective for treatment of small flows. Research conducted on these units shows that more nutrients are trapped than by individual septic systems.	Small areas of land are necessary for the installation of such systems.	The cluster system alternative includes large septic tanks that require pumping every other year. Waste would need to be hauled away to the nearest approved disposal site or wastewater treatment plant for further treatment.
<b>Compost Toilets</b>	Compost toilets decompose human wastes by a natural biological process. With the aid of air and/or some heat, human waste will degrade itself over an extended period of time. This process is similar to the decomposition process in composting leaves and manure piles used for garden and agricultural crop enrichment.	Eliminates black water (waste water associated with toilet and urinal useage) flow. By eliminating black water, approximately a 40% reduction in total flow can be achieved.	Gray water (domestic wastewater such as water from baths, showers, sinks, and clothes washers) still requires a septic tank and soil absorption system. Potential for breeding of flies, odors, and hydraulic overload. Problem with public acceptance.	The total decomposition time ranges from 1-1/2 to 2 years initially, and from 3 to 12 months thereafter. At the end of this time, the wastes have been reduced to rich odorless humus that can be removed and used as garden soil. This is the only required maintenance except for the occasional addition of enzymes for certain internal units.

**Table 1: Alternative Waste Disposal Systems (continued)**

<b>Treatment Method</b>	<b>What is it?</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Special Considerations</b>
<b>Individual Treatment and Recycle</b>	This recycle system is a self-contained package treatment unit specifically designed to treat black water (waste water associated with toilet and urinal usage).	Reduces flow from home.	Still requires septic tank and soil absorption system. High cost and high maintenance.	
<b>Low Water Flush</b>	Several low water flush toilets are available which utilize from one quart to two gallons of water instead of the average five to eight gallons used by a standard flush toilet.	Reduces black water (waste water associated with toilet and urinal usage) flows.	Concentration of organic loading still high. Gray water still requires treatment and disposal.	
<b>Gray Water Flow Reduction</b>	Unlike concentrated human waste, gray water can not be completely eliminated as domestic wastewater by recycling or composting. However, many devices are available for water conservation that greatly reduce gray water quantities. For example, flow restrictors and regulators could be placed on faucets and showerheads.	Reduces volume of wastewater requiring treatment. Many flow reduction devices cost less than \$15.00 and can be purchased at local hardware stores.	Concentration of organic loading still high. Treatment and disposal still required.	The average person showering will use 6 gallons of water per minute for 7.5 minutes with a standard showerhead. Should a 3-gallon per minute flow reduction be installed, an average family of four persons could save 90 gallons of water per day, assuming each person showered once per day.